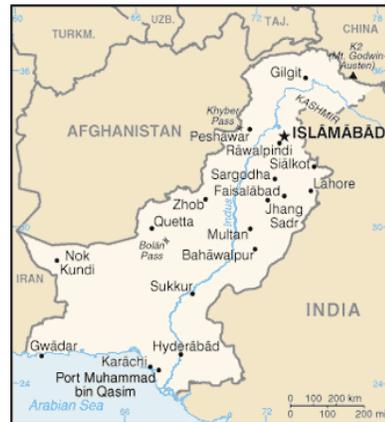


## Building Pakistan's Capacity for Instruction, Research, and Practice in Earthquake Engineering and Retrofit

On October 8, 2005, a magnitude 7.6 earthquake affected Pakistan, India, and Afghanistan with the epicenter located near Muzaffarabad, which is approximately 86 mi (138 km) northeast of Islamabad. The earthquake killed more than 73,000 people, injured more than 128,000, and rendered millions homeless throughout a mountainous region in northern Pakistan. Because it struck during school hours, schools and children were particularly affected where at least 8,000 schools collapsed or were damaged beyond repair in the Northwest Frontier Province and another 2,000 in the less-populous Kashmir region, resulting in the death of at least 17,000 children, and the serious injury of thousands more.



Source:  
[http://www.appliedlanguage.com/maps\\_of\\_the\\_world/](http://www.appliedlanguage.com/maps_of_the_world/)

In response to this disaster, Pakistan-US Cooperative Program in Earthquake-Related Research funded a project aiming to improve Pakistan's earthquake engineering education capacity. This program is managed on the US side by the National Academies with funds provided by the US Agency for International Development (USAID); funds on the Pakistani side are provided by Pakistan Higher Education Commission. In January 2007, the program awarded a three-year collaborative grant to GeoHazards International (GHI) and NED University of Engineering and Technology, Karachi. The research team is comprised, on the Pakistan side, of Dr. Sarosh Lodi (NED) and Dr. Sahibzada Rafeeqi (NED), and, on the US side, of Dr. Gregory Deierlein (Stanford University), Mr. David Mar (Tipping-Mar+Associates), Dr. Khalid Mosalam (UC-Berkeley), Dr. Janise Rodgers (GHI), Mr. Thomas Tobin (GHI), and Dr. Brian Tucker (GHI).

The project will improve Pakistan's capacity for reducing earthquake risk by building the capacity of its universities to teach and conduct research in earthquake engineering and transfer the knowledge needed to seismically retrofit essential structures to both new graduates and practitioners. The approach integrates formal instruction in theory with practice by using case studies of existing buildings typical of the local building stock in Pakistan. It recognizes that earthquake engineering exists in a broader societal context that balances safety with competing demands and values by employing multi-disciplinary earthquake risk management decision-making processes. The project will build sustainable academic interest in earthquake engineering research by encouraging cooperative research and professional relationships with American researchers through academic exchange and a study tour in California, consultation on research topics that directly impact seismic safety in Pakistan, and creation of an earthquake engineering research agenda for Pakistan. The Pacific Earthquake Engineering Research (PEER) center, as one of the collaborating institutions, is contributing to the project by facilitating academic exchange and encouraging cooperation between the US and Pakistan.

The project's first face-to-face meeting took place in Pakistan, July 21-28, 2007 where the US participants visited several sites in Karachi, Islamabad city, and the earthquake affected areas in Rawalakot, Bagh, Chakothi and Muzaffarabad. The purpose of the visit was threefold: beginning to develop the case studies, improving the existing curriculum, and meeting with project partners throughout the country. The case study development began with defining characteristic building types and training a selected group of graduate students and junior faculty to rapidly screen buildings. Curriculum improvement efforts began with determining how the project can help build on existing capacity in earthquake engineering in Pakistan's universities and benefit from the experiences of US universities such as UC-Berkeley and Stanford. During the visit, the US research team was able to meet with Pakistani project partners in academia, private practice, and government. On July, 21, 2007, the Pakistan Chapter of the American Concrete Institute (ACI) organized and sponsored a seminar given by the US research team members entitled "Performance-Based Earthquake Engineering and Applications to the Evaluation and Retrofit of Existing Buildings." The seminar was well-attended by students, faculty and practicing engineers with approximately 100 attendees. The research team will conduct similar activities when the participants from Pakistan visit the San Francisco Bay Area in October 2007. This visit will be an opportunity to interact with interested faculty and practicing engineers. For further information, please contact one of the research team members listed above.



Research team together with the chancellor and administrative members of NED University, Karachi



Research team during their visit to earthquake damaged sites in Rawalakot, Bagh, Chakothe and Muzaffarabad [Photo by G. Deierlein]



Arial view of earthquake affected region and reconstruction near Muzaffarabad [Photo by J. Rodgers]



Adding conventional reinforcing steel bars  
[Photo by T. Tobin]



Traditional (Dhajji-Dewari) construction  
for timber laced adobe [Photo by D. Mar]

Housing Reconstruction Center (HRC) established by UN-HABITAT and Earthquake Reconstruction and Rehabilitation Authority (ERRA) in Pakistan-administered Kashmir